REMARKS

Applicant hereby responds to Office Action of April 6, 2006, in the above-referenced patent application. Claims 1-30 were pending in the above-referenced patent application. Claims 1-21 were withdrawn from consideration, and Claims 22-30 were examined on the merits.

The specification has been amended to correct minor typographical errors, and harmonize description of Fig. 4 with the content of Fig. 4. Claims 22, 23 and 26-30, have been amended to further clarify the claimed limitations. New claims 31-39 have been added. As such claims 22-39 are pending in this application. New matter has not been added.

Claims 22-30 were rejected under 35 USC 102(e) as being anticipated by Kusakabe et al, US 2005/0031223 A1,2/2005 (hereinafter "Kusakabe").

Argument

Rejection of claims 22-30 under 35 USC 102(e) as being anticipated by Kusakabe is respectfully traversed because, for at least the following reasons, Kusakabe does not disclose all of the claimed limitations.

The present invention and Kusakabe are fundamentally different and patentably distinct. According to the claimed invention herein, subsets of an input image (picture) are analyzed as one or more windows. For each such window in the input image, if the window is around a detected ringing-like area in the image, then a smoothed version of the pixels in the window are selected for output. However, if the window is not around a ringing-like area, then the pixels in

the window (from the input image) are selected for output. Therefore, the output image includes portions of the input image in which ringing artifacts were not detected, and includes smoothed pixels corresponding to portions of the input image where ringing artifacts were detected, whereby ringing-like artifacts of the input image are suppressed in the output image.

By contrast, Kusakabe is directed to an image processing apparatus which removes conspicuous noise contained in the image. A parameter determination module (103) determines predetermined parameters used in a noise removal process, based on resolution or enlargement ratio upon outputting image data. An individual noise removal module (104) removes noise contained in the image data using the parameters. (Abstract).

As per **Claim 22** (as amended) it is respectfully submitted that despite the Examiner's interpretation, Kusakabe does not disclose: "a ringing-artifact detector that detects areas of ringing artifacts in a pixel window based on the pixel information, the pixel window including a set of pixels from the input image pixels," as claimed herein. Despite the Examiner's interpretation, element 104 in Kusakabe is a noise removal unit (e.g., paras 0037, 0057), and does not perform any ringing-artifact detection in a pixel window based on the pixel information, as claimed.

In para 0107 (relied on by the Examiner), Kusakabe does not disclose detecting areas of ringing artifacts in a pixel window based on the pixel information, as claimed. Rather in para 0107, Kusakabe mentions determining difference between RGB values of an arbitrarily selected

pixel and a pixel of interest. There is no disclosure in Kusakabe that this difference indicates ringing artifacts, or that the difference is used to determine ringing artifacts, as claimed.

In para 0107 Kusakabe only mentions that if the difference is smaller than a threshold value, then the pixel of interest is substituted by the arbitrarily selected pixel, otherwise it is not substituted. In this way, Kusakabe performs noise removal by *a noise distribution process*, wherein visible noise in a window is distributed in the window (para 0100). The threshold value for substitution is determined by module 103 based on output image resolution (para 0103).

Further, it is respectfully submitted that Kusakabe para 0015 (relied on by the Examiner), does not disclose: "an image processor that processes window pixels to generate pixels with reduced ringing artifacts," as claimed. In para 0015 Kusakabe states:

> [0015] In order to achieve the above object, an image processing apparatus according to the present invention is characterized by comprising image input means for inputting image data that contains noise, output condition input means for inputting an output condition upon outputting the image data, noise removal means for removing the noise contained in the image data using a predetermined parameter, parameter determination means for determining the parameter on the basis of the output condition, and output means for outputting image data after the noise has been removed.

There is not even mention of ringing artifacts in Kusakabe. In para 0015 Kusakabe provides a general description of the entire noise removal apparatus, without any mention of an image processor that processes window pixels to generate pixels with reduced ringing artifacts.

Further, in Figs. 11A-B (relied on by the Examiner), Kusakabe states that FIG. 11A shows an image state as a result of the *noise distribution process* using pixel window 602 as the processing range for the image in FIG. 6A (para 0112). Kusakabe (para 0113) states that in FIG. 11A, reference numeral 1100 denotes pixels, which belonged to the non-noise region 601 before the noise distribution process, but to which the pixel values of the noise region are distributed as a result of the noise distribution process. Reference numeral 1101 denotes pixels, which belonged to the noise region 600 before the process, but which are replaced by pixel values of the non-noise region 601 since the noise region is distributed as a result of the noise distribution process.

Kusakabe further states (para 0115) that FIG. 11B shows an image state as a result of *the noise distribution process* which is executed using pixel window 603 as the processing range for the image in FIG. 6A. In FIG. 11B, the noise distribution process is done using the processing region which is large enough with respect to the size of the noise region 600. For this reason, the central portion of the noise region 600 undergoes pixel value substitution, and a cluster of noise components, which are readily visually detectable, are distributed, thus obtaining a noise removal effect.

As is glaringly obvious from description of Figs. 11A-B in Kusakabe, there is no disclosure therein about an image processor that processes window pixels to generate pixels with reduced ringing artifacts. Noise distribution to simulate a noise removal effect is patentably distinct from reducing ringing artifacts, as claimed.

Further, Kusakabe (para 0015, para 0113, para 0122-0124 and fig. 11), does not disclose the combiner, as claimed. As discussed, para 0015 only generally refers to a noise removal apparatus. Further, para 0113, 0122-0124 mention noise removal by a noise distribution process. As discussed, the noise distribution process involves determining difference between RGB values of an *arbitrarily* selected pixel and a pixel of interest. If the difference is smaller than a threshold value, then the pixel of interest is substituted by the arbitrarily selected pixel, otherwise it is not substituted. As such, noise in the window is distributed around in the window (para 0100).

There are no pixels in Kusakabe that are processed to reduce their ringing artifacts, rather the pixels in Kusakabe are distributed around to distribute noise in the window. Substituting a pixel of interest in the window with a randomly selected pixel according to Kusakabe, is not the same as reducing ringing artifact of the pixel of interest, as claimed.

Further, there is no disclosure in Kusakabe of selecting processed pixels with reduced ringing artifacts in the detected ringing-artifact areas. As discussed, Kusakabe does not detect ringing artifact areas in the window. In addition, Kusakabe simply distributes noise in the window by substituting a pixel of interest with a randomly selected one (by comparing their

difference to a threshold). As such, Kusakabe cannot, and does not, generate an output image comprising: (i) selected processed pixels with reduced ringing artifacts, and (ii) remaining window pixels from the input image. In other words, Kusakabe does not generate an output image that includes portions of the input image where ringing artifacts were not detected, and portions of the processed image corresponding to areas in the input image where ringing artifacts were detected, such that the output image is an enhanced version of the input image with ringing artifacts substantially reduced, as claimed.

For at least the above reasons, it is respectfully submitted that claim 22 and all claims dependent therefrom (claims 23-38), are allowable.

As per **Claim 23** (as amended), Kusakabe does not disclose the ringing-artifact detector comprises a pattern detection function that detects ringing pattern-like features indicating the areas of ringing in the pixel window as a function of gradation level differences between one or more pixels therein, as claimed. Kusakabe (para 0109, 0127, fig. 13, relied on by the Examiner), mentions the pixel values to be used for determining said pixel difference value for noise removal by noise distribution, and further varying the noise distribution amount by selecting said window size, and said threshold, based on output image resolution. There is no disclosure in Kusakabe, whatsoever, of gradation levels, or determining areas of ringing based on gradation levels in Kusakabe.

As per **Claim 24**, Kusakabe (pare 0137, para 0169, relied on by the Examiner), does not disclose that: "the ringing-artifact detector determines the gradation level difference between a

pixel and that of neighboring pixels, and detects if the gradation level difference is within a selected threshold, indicating ringing-like artifacts proximate that pixel position in the window," as claimed. In para 0137, Kusakabe simply mentions said RGB difference values, which as discussed, do not disclose gradation level difference. Further, in Kusakabe said RGB difference is between a pixel of interest and a randomly selected pixel, whereas as claimed herein, a gradation level difference is determined between a pixel of interest and neighboring pixels.

In addition, in para 0169, Kusakabe simply mentions that a granularity is more likely to be visually recognized depending on the resolution upon displaying or printing an image. Hence, when the granularity is visually conspicuous in correspondence with the output resolution, parameters are determined to adjust noise removal to reduce adverse effects of noise removal based on output image resolution that is used to select said threshold value for noise distribution by pixel substitution of Kusakabe, discussed above. This has nothing to do with determining ringing artifacts areas by comparing gradation level differences to a threshold, as claimed.

As per **Claim 25**, it is respectfully submitted that Kusakabe (para 0008, para 0132, relied on by the Examiner), does not disclose the image processor includes a low pass filter that reduces ringing artifacts, as claimed. In para 0008 Kusakabe generally mentions LPF, and in para 0132, Kusakabe mentions a case wherein noise removal process suppresses its adverse effect by determining the processing ranges and weights used upon calculating the weighted mean on the basis of conspicuity of the adverse effect of the noise removal process depending on the output resolution in the noise removal process using an LPF. However, Kusakabe does not disclose applying LPF to the original image to generate pixels with reduced ringing artifacts and using

detected ringing artifact areas for selecting portion of original image to combine with ringing artifact reduced pixels, as claimed.

As per **Claim 26** (as amended), it is respectfully submitted that for at least the above reasons, Kusakabe (para 0008, para 0132, relied on by the Examiner), does not disclose the image processor includes smoother that reduces ringing artifacts, as claimed. A smoother is not even mentioned in Kusakabe.

As per **Claim 27** (as amended), it is respectfully submitted that Kusakabe (para 0107-0109, relied on by the Examiner) does not disclose a variance detector that determines local variance of each pixel in the window with respect to neighboring pixels, wherein the local variances indicate presence of noisy areas in the image, as claimed. In paras 0107-0109, Kusakabe mentions determining difference between RGB values of an arbitrarily selected pixel and a pixel of interest. If the difference is smaller than a threshold value, then the pixel of interest is substituted by the arbitrarily selected pixel, otherwise it is not substituted. Not only is a local variance not determined for each pixel, but even the different value is between a pixel of interest and an arbitrary pixel, rather than neighboring pixels, as claimed.

Further, Kusakabe (para 0114, 0120, relied on by the Examiner), does not disclose a signal detector that based on the local variances, detects if the location of the window is proximate a noisy area in the input image. The Examiner states that the threshold values of the luminance parameters are used to detect noise/signal when comparing pixels within a window, such that the window size is adjusted during the noise suppression process to sufficiently reduce

noise. Applicant traverses this interpretation of Kusakabe by the Examiner. As discussed, in Kusakabe the window size is based on output image resolution in order to reduce adverse effects of noise removal, not based on threshold values for pixel substitution in noise distribution. Further, any window size adjustment in Kusakabe, has nothing to do with detecting if the window is proximate a noise area in the input image, according to the present invention.

Finally, for at least the reasons above, and the reasons discussed in relation to Claim 22, Kusakabe does not disclose the claimed combiner. Further, there is no disclosure in para 0122-0124, 0016, 0113, of Kusakabe that teaches a combiner that further selects pixels with reduced ringing artifacts from the processed pixels, based on the detected ringing artifact areas and the detected window location information, and generates that enhanced output image comprising: (i) the selected pixels with reduced ringing artifacts, and (ii) the remaining window pixels from the input image, as claimed. Further, in Kusakabe, no window location is detected, only the window size for pixel distribution is changed based on output image resolution in order to reduce adverse effects of noise removal. In addition, in Kusakabe, no decision as to pixel selection is made based on location of a window.

As per **Claim 28**, it is respectfully submitted that Kusakabe (para 0122-0124, relied on by the Examiner) does not disclose that the combiner selects pixels with reduced ringing artifacts from the processed pixels in the detected ringing artifact areas, based on the window location information. Kusakabe mentions noise removal by a noise distribution process. As discussed, the noise distribution process involves determining difference between RGB values of an *arbitrarily* selected pixel and a pixel of interest. If the difference is smaller than a threshold

value, then the pixel of interest is substituted by the arbitrarily selected pixel, otherwise it is not substituted. As such, noise in the window is distributed around in the window (para 0100). This has nothing to do with a combiner that selects pixels with reduced ringing, based on window location information.

As per **Claim 29** (as amended), for at least the above reasons, Kusakabe (para 0122-0124, relied on by the Examiner) does not disclose that the combiner selects pixels with reduced ringing artifacts from the processed pixels in the detected ringing artifact areas, corresponding to substantially noisy input image locations, as claimed.

As per **Claim 30** (as amended), Kusakabe does not disclose that the input image comprises a decompressed image, such that said ringing artifacts were generated by image compression and/or decompression, as claimed. Despite the Examiner's interpretation, even the word compress or the concept of ringing artifacts due to image compression and/or decompression, does not appear anywhere in Kusakabe.

New Claims

New claims 31-39 add further limitations that are allowable over cited references, for at least the reasons provided above.

CONCLUSION

If necessary, the Commissioner is hereby authorized to charge payment or credit or any overpayment to Deposit Account No. 01-1960 for any additional fees required with respect to this filing. A duplicate copy of this page is enclosed for this purpose.

For these, and other, reasons, Applicants believe that the claims are in condition for allowance. Reconsideration, re-examination, and allowance of all claims are respectfully requested. If it is believed that a telephone interview will help further the prosecution of this case, Applicants respectfully request that the undersigned attorney be contacted at the listed telephone number.

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: MS Amendment Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on July 5, 2006.

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Respectfully submitted,

7/5/06

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